

Headquarters U.S. Air Force

Integrity - Service - Excellence

United States Air Force Space Weather



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HQ USAF/A3W
2 May 2017**



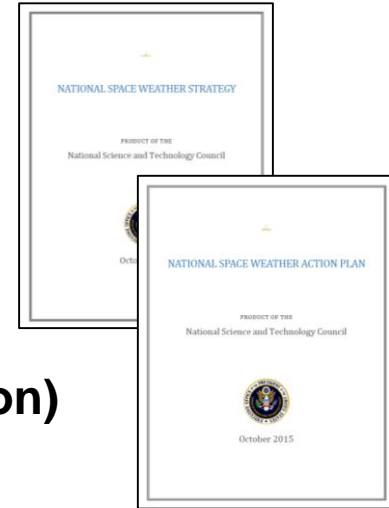
Overview

- **DoD National Space Weather Action Plan (NSWAP) Engagement**
- **Space Weather Research to Operations (R2O) Mandate**
- **DoD R2O Investment**
- **R2O/O2R Warfighter Support Process**
- **Commercial Weather Data Pilot Program**
- **Summary**



DoD NSWAP Engagement

- **Co-lead or Supporting Agency for 34 NSWAP tasks**
 - Drawing expertise from range of DoD organizations – AFRL, NRL, AFOSR, SMC, AFSPC, JSpOC, 557 WW
 - Task 5.3.5 lead sustaining ground-based solar radio obs
- **Developing Annex covering items not contained in NSWAP that impact military operations (e.g., geolocation)**
- **White House Situation Room**
 - Classified support to POTUS & National Security Council during events impacting national & international critical infrastructure or security
- **Executive Order (13744)**
 - Developing preparedness CONOPS and checklist in collaboration with FEMA to coordinate Federal assets/activities in response to and to protect against impending space weather events





Space Weather R2O Mandate

- **Executive Order 13744, Coordinating Efforts to Prepare the Nation for Space Weather Events**
 - “...SECDEF...in collaboration with other agencies as appropriate, shall identify mechanisms for advancing space weather observations, models, and predictions, and for **sustaining and transitioning capabilities from research to operations and operations to research**, collaborating with industry and academia”
- **National Space Weather Action Plan**
 - “...enhance coordination between research modeling centers and forecasting centers...**transitioning research models to forecasting centers**”
 - “...ensure the improvement, testing, and maintenance of operational forecasting models...leverage existing capabilities in academia and private sector...**enable feedback from operations to research**”
- **Proposed S.2817 Space Weather Research and Forecasting Act**
 - “SECAF shall develop mechanisms to **transition research findings, models, and capabilities** to...space weather **operational forecasting centers**”



DoD R2O Investment

■ **Meeting the Space Weather R2O mandate requires:**

1. **Highly educated and trained force of military and civilian operators**
 - Capable of recognizing, evaluating, and communicating operational gaps to feed the R2O/O2R process
2. **Energetic RDT&E relationships with government/DoD labs, academia, and the commercial sector**
 - Foster connections in the broader community allowing rapid development, acquisition, and adoption of next generation technology and applications to meet operational requirements and shorten the R2O/O2R timeline
3. **Space weather operators engaging with the Warfighter and Civil Agencies**
 - Integrated into planning and execution at all warfighter echelons – identify current and future warfighter needs and gaps
 - Collaborate with civil space weather community to realize R2O/O2R goals based on mutual operational priorities



R2O/O2R

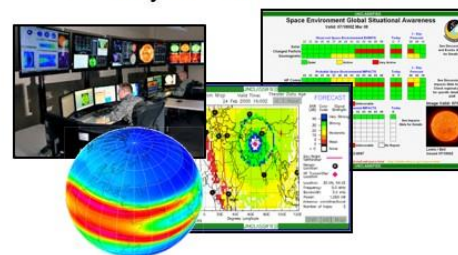
Warfighter Support Process

Incentivize innovation to find competitive solutions by invigorating the industrial, commercial, and academic sectors
- *USAF Strategic Master Plan, May 2015*

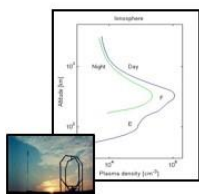
Capability transitioned to operations to provide specification and forecasts of Space Environment

R2O

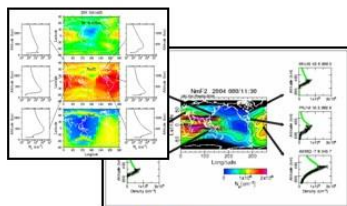
Operational centers produce mission- & user-tailored products at multiple security classification levels



Labs, Academia, and Industry develop and test observing, characterization and forecast capabilities to meet operational requirements



Instruments



Models

O2R

Operational feedback and requirements fed to Space Weather research community through S&T process

Highly educated & trained space weather operators engaged at the product development and user application levels to identify capability shortfalls



Space Environmental products support the warfighter, national security, and civil agencies

Breaking Barriers ... Since 1947



Commercial Weather Data Pilot Program

- **DoD tasked to conduct assessment of available commercial satellite weather data**
 - Review existing spaced based commercial providers
 - Identify potential Space Based Environmental Monitoring applications to enhance DoD mission requirements
- **NOAA pilot evaluating commercial GPS Radio Occultation (RO) on-orbit data to demonstrate the data quality and value in atmospheric models**
- **DoD evaluation will focus on GPS RO Electron Density data stream**
 - Assess quality of commercial satellite-sensed RO electron density data
 - Compare Global Assimilation of Ionospheric Measurements (GAIM) model characterizations with and without commercial ionospheric data
 - Determine/quantify the military utility of commercial ionospheric data
- **DoD and NOAA pilot programs are mutually beneficial**



Summary

- Air Force committed to space environment needs...now & future
- Investment in Space Weather – People, Engagement, Collaboration
- Community partner supporting National-DoD research & operations

Global Power



Global Reach



Air Ops



Agile Combat Support



“Air Force weather enables Joint Warfighters to anticipate and exploit the weather...for air, ground, space, cyberspace and intel operations.”

– AFW Mission



Army Ops



Global Vigilance



Special Ops



Space Weather

Breaking Barriers ... Since 1947